Chapter 6: Analysis of Data  (B - Computer Assisted Learning in the Context of Alternative Framework)

Men seldom take the opinion of their equals, or of a man like themselves, on trust.

Alexis de Tocqueville (1805 - 1859)
- From ‘Democracy in America’

This chapter 6 is the second section pertaining to the analysis of data that focuses on exploring teachers’ perceptions related to addressing Alternative Frameworks among learners of science using computer-assisted learning. For this purpose the chapter has been divided into three subsections. In the first subsection, an introduction to the chapter is presented. The second subsection (that has further been divided into eight relevant subparts) relates to the specific questions which have been responded to by the science teachers. These sub parts have been developed in terms of themes that emerged spontaneously from the teachers’ responses. The code numbers (IDs) of the respective teachers indicate the frequency of the themes that emerged. A summary in terms of conclusions has been developed in the third subsection.

6.1 Introduction

The focal areas in the chapter relate to computer assisted learning and similar terms, teachers’ and learners adequacy in using computer assisted learning, understanding teachers’ perception of alternative frameworks, characteristics desirable computer assisted learning programme, use of computer assisted learning in addressing alternative frameworks and classroom experiences of responding teachers based upon their responses on the related questionnaire. These focal areas had been built to analyse different concerns in the context of understanding science teachers’ perceptions on the issue of using computer assisted learning for addressing alternative frameworks among learners in science.
6.2 Teachers’ perceptions about Computer Assisted Learning and its Efficacy in Addressing Alternative Frameworks

This section of the chapter analyses science teachers’ perception about Computer Assisted Learning and its efficacy in addressing Alternative Frameworks among learners in science. This section has been used to draw features of Computer-Assisted Learning program in science that the teacher would like to have. The analysis is based on the responses received from the sample of 37 science teachers on the questionnaire containing eight questions on this area. The questions asked in the questionnaire that have been analysed, are given in the subsections. Each subsection has been divided into different themes that emerged from the teachers’ responses naturally. The themes have the number of respondents represented against each of them and the Teacher ID with those views / responses have also been given.

6.2.1 Computer Assisted Learning and Similar Terms

This subsection on Computer-Assisted Learning and similar terms is based upon science teachers’ responses on the following question. This question has been analysed into two parts. Part first is based upon the science teachers’ knowledge about computer-assisted learning and the second part based upon other similar terms that the science teachers are aware of.

Q1. What do you know about Computer Assisted Learning (Computer Assisted Learning)? What other similar terms are you aware of? Differentiate between them?

Learning as fun (3 teachers with id’s 1.06, 1.04, 1.18) Computer Assisted Learning is a new and innovative approach that helps in making the teaching learning process joyful and interesting, can be developed as per prescribed syllabus or for supplementing classroom learning.

Teachers think that now a days, education has become one of the important spheres, where computer based technology is being used widely, to enhance teaching learning process. Computer Assisted Learning is a new and innovative approach to learning. Computer Assisted Learning helps us to make present teaching learning process joyful, interesting and easy to understand through audio-visual aids. Teachers are resourced with multimedia courseware/educational software developed according
to the prescribed syllabus; according to the age and grade of the learners. This courseware may contain the content (with more visually stimulating graphics, sound, animations, videos, etc.), tutorials, drill and practice sessions, etc, to supplement classroom learning.

This view acknowledges education as having an important application of computer-based technology that makes learning process interesting. Learning does not remain a burden for the learner and become a stimulating exercise that is supplemented by drills, practices and tutorials.

**Means of learning**  (30 teachers with Teacher ID 1.01, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.20, 1.21, 1.22, 1.23, 1.24, 1.25, 1.26, 1.27, 1.28, 1.30, 2.05, 2.07)

“Computer Assisted Learning means a method of learning in which learners learn through computer or type of learning carried out with the help of a computer.”

We can call this interventionist model of looking at computer-assisted learning.

**Supporting experimentation and instruction** (10 teachers with Teacher ID 2.07, 1.19, 1.20, 1.04, 1.21, 1.26, 1.02, 1.16, 1.03, 1.08)

Some of the teachers see the Computer Assisted Learning as Computer-assisted instruction (CAI) or remediation presented on a computer. One of the teachers mentions that many educational computer programs are available online and from computer stores and textbook companies. They enhance teacher instruction in several ways. Some teachers view Computer Assisted Learning as a collection of experiments (as in Physics lab we learn Physics) on the course software package to understand the concepts and techniques. One teacher noted that Computer-Assisted Learning is an encompassing term which generally refers to 3 major uses of computers in education and training - Computer-Assisted Instruction, Computer-Managed Instruction and Using Computers as Tools.

To add another teacher’s view, “Computer-assessed learning enables a powerful way to comprehend complex concepts, as the name itself suggests the process of learning takes place in presence of computer, learner and teacher”.

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Information dissemination tool (9 teachers with Teacher ID 1.13, 1.11, 1.04, 1.18, 1.29, 1.26, 1.02, 1.03, 1.08)

Some learners have seen the use of Computer-assisted learning to convey a vast amount of information in a very short period of time. It is a powerful method of reinforcing a concept. This can be termed as a dry and a limiting model of understanding computer-assisted learning. This understanding of Computer-Assisted Learning does not take cognizance of the huge potential that computers have.

Learner’s self study device (7 teachers with Teacher ID 1.04, 1.16, 1.03, 1.25, 1.20, 1.18, 1.08)

“Computer Assisted Learning” is used to describe a relatively more integrative approach whereby the program does not actually replace a lecture but is introduced into the course as a learning resource. Here the learners experience directed learning (directed by the lecturer) or self study which takes place “outside” the main curriculum hours, (i.e. the primary contact hours between learner and tutor), and thus beyond any level of support from traditional methods. In fact the term Computer Assisted Learning used in this context describes little more than an “add on” or “bolt on” resource for learner self study whose success in terms of usage is dependent upon a number of learner centred factors, not least their self discipline and motivation.

Content specialist (8 teachers with Teacher ID 1.04, 1.18, 1.14, 1.26, 1.02, 1.16, 1.08, 1.05)

Computer Assisted Learning as an augmented computer based interactive and individualized learning environment with learner, computer, teacher and courseware developer as distinguished constituents. Interaction is in between a learner and a computer. The teacher sets the learning environment in order to improve the learner's academic performances with the help of courseware logically-sequentially developed and programmed using text, images, animations, audios, videos and hyper link by the teacher/content specialist or may be with the help of computer proficient individual. The term Computer Assisted Learning (Computer Assisted Learning) covers a range of computer-based packages, which aim to provide interactive instruction usually in a specific subject area, and many predate the internet. These can range from
sophisticated and expensive commercial packages to applications developed by projects in other educational institutions or national initiatives to simple solutions developed by individuals with no funding or support to tackle a very local problem. The amount of time and money invested in development is high and partly because of the very subject specific nature of the education market as well as the very personalised nature of the teaching process - particularly at higher education level - means that commercial success is difficult to achieve and work done in one subject area rarely transfers to others subject areas.

**Learning Machine**  (11 teachers with Teacher ID 1.13, 1.20, 1.04, 1.18, 1.29, 1.26, 1.02, 1.16, 1.03, 1.08, 1.05)

Computer Assisted Learning is a method of conveying a vast amount of information in a very short period of time or enable in a powerful way to help learners comprehend complex concepts through the computer system. Computer Assisted Learning is similar to the experimental modes of learning in which we learn how to learn. One gets feedback from the computer output and then adjusts thinking process to use the computer in order to understand various concepts like linear programming, science operations etc. But before using its software it places a challenge for us to learn new technology mainly-the use of software which helps us in other field of work also.

“Computer Assisted Learning is a natural outgrowth of the application of the principles of programming instruction or learning. The main objective of programmed learning is to provide individualised instruction just to fulfil special selected part of stored information. A computer fulfils all these requirements. It can restore organising the information can process information suit the needs of individual learners. In short, Computer Assisted Learning covers the entire educational system by providing a useful role in teaching various subjects.”

**Terms used:**
A lot of other terms similar as Computer Assisted Learning (Teacher ID 1.01, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.20, 1.21, 1.22, 1.23, 1.24, 1.25, 1.26, 1.27, 1.28, 1.30, 2.05, 2.07)
Computer Assisted Instruction (CAI) or Computer Aided Instruction (CAI)

In CAI instructions are given with the help of a computer. It is the method of learning for the learners. Computer assisted instruction is an individualized learning process in which learners learn individually through the help of designed computer software. In this process computer gives instruction and learners do follow.

Computer Based Instruction (CBI) or Computer Based Education (CBE)

Computer based instruction is the process of teaching learning with the help of computer for e.g. OHP, audio-video aids, power point presentation etc. It is a group teaching learning process.

Computer Managed Instruction (CMI)

The computer provides the instruction. There is no person behind the instruction. All the instruction is managed by computer as pre-programmed by a programmer.

Computer Based Teaching (CBT)

The teacher is physically present in front of you & explains theoretical topics on board & practical topics on computer.

Computer Assisted Teaching (CAT)

The teacher is not physically present around learners. The teacher will teach learners through the net via video conferencing, all the theory & practical material are provided in a soft copy.

The terms Web Based Learning (WBL) and Web Based Instruction (WBI) have also been used by the teachers without giving any details and differentiations.

6.2.2 Teachers’ adequacy in using Computer Assisted Learning

Q2. How comfortable do you feel in using computers in the classroom?

Comfortable

Out of 30 Teachers-

- 12 were very comfortable in using computer while teaching.
- 2 were not that comfortable in using computers in teaching.
- Rest 16 teachers have not given their clear point of view about their adequacy in using computers as part of their teaching strategies.

Some more descriptions given by teachers
Computers can create interest among the learners and we can also explain some difficult concepts such as formation of waves, impact of collisions etc. using computer simulators. Although there are many benefits of computer but there should be a healthy and proper use of computer in teaching i.e. no social networking or gaming while teaching.

Strength of learners is quite more and it generally takes much time in adjusting the learners and setting the computer because there was no facility of computers in classrooms and every time we have to move to computer laboratory. So it generally creates disturbance in such schools where there is no multimedia facility in classrooms.

Computers in the classroom include digital technology used to enhance, supplement, or replace a traditional educational curriculum. As computers have become more accessible, inexpensive, and powerful, the demand for this technology has increased. They fulfil the needs of teaching materials and are more expressive.

Computers allow learners with disabilities to become independent and hand in legible assignments, as well as provide learners with vast information. This is very comfortable to use, as compared to the rigorous and old methods of teaching. Computers help in developing the interests of learners in a particular subject.

By using computer we can decrease the overburden of learners’ stress & reduce many functions of teachers. Computers help teacher to make immediate feedback & responses to the learners. If develops creative environment in the classroom & independent learning to the learners.

The use of audio visual aids, images and in addition to its various interesting clips helps a teacher in bringing the attention and interest of learners to the topic.

To begin with, it might be difficult to maintain discipline but with the passage of time it will improve. With technological advancement, the teaching methods are also changing accordingly. Teachers in the modern classroom stand to benefit from integrating computer technology into their curriculum as learners can work through computer based activities at their own pace. Rather
than 25 individuals working together on one activity, technology allows independent completion of work. Those who begin to fall behind can receive an instructor’s individualized attention while others can begin to tackle more complex tasks. So, using computers in the classroom has proved to be a more effective method of teaching. Therefore, everyone should have the knowledge of computer & must feel comfortable in using computers in their classroom.

- Computers can allow learners to communicate with other learners, from other schools and improve professional communication skills. Learners with disabilities or illegible writing can use computers and therefore they can submit neat and legible assignments. Computers offer access to a wide variety of information, on a multitude of topics. Using computers in primary schools allow learners to acquire skills that will be necessary in later life.

- We use computers to develop a presentation in a simple and effective manner. They just use simple Microsoft paint tool and made a presentation on Microsoft Word. I was surprised to see the presentation. This shows that learners are interested in using computers to communicate their ideas and views so that they are easily grasped and understood.

- Computer is quite helpful in classroom as through this we can give learners a three dimensional model which is not easy to show in real classroom, some chemistry experiments, physics experiments and some other experiments which are cannot be easily performed.

6.2.3 Learners’ adequacy in using Computer Assisted Learning

Q3. As per your school experience, how comfortable your learners may be in using Computer Assisted Learning material on their own?

The teachers have described their learning comfort as per their experiences represented in the themes:

Socio-economic background (7 teachers with Teacher ID 1.06, 2.07, 1.29, 1.28, 1.26, 1.02, 1.03)

In some schools, learners were from a weak economic background. Most of them were not even aware about computer or internet. In that school there was a computer centre but that was only for namesake. The computers there were just empty
boxes with dust. Teacher never saw the computers working. Also when the teacher
gave the feedback forms to the learners there was a question about learning sources.
The teacher found that none of their learners had written ‘Internet’ as a source. Most
of them used their textbook as primary source of learning. So the teacher thinks their
learners may not be very comfortable in using computer-assisted learning on their
own.

**Self learning**  (8 teachers with Teacher ID 1.05, 1.13, 1.25, 1.12, 1.30, 1.04, 1.14,
1.03)

According to the teachers, Computer Assisted Learning provides the desired
information learners need. Due to its use the learner can learn a lot by adopting an
enquiry approach towards self learning. Teachers said that, learners are quite
comfortable and enjoy a lot in learning through computers because everybody has
access to it now a days and it is the easiest source to satisfy our curiosity and needs.
Computer Assisted Learning provides learner with different type of drill and practice
programmes related to content and provide the problems of varying difficulty levels
on the basis of learners’ performance in the whole session.

**Learning computer** (7 teachers with Teacher ID 1.05, 1.02, 1.12, 1.30, 1.04, 1.03,
1.07)

Through the school experiences learner will be able to use the computer
software technology for learning and can design their learning exercise also and in
presenting projects in a very interactive form by adding various segments like images,
videos, audios, effects etc.

**Structural and systemic barriers** (10 teachers with Teacher ID 2.07, 1.19, 1.11,
1.04, 1.29, 1.28, 1.21, 1.26, 1.02, 1.16)

As per their school teaching experience some teachers have seen learners are not
much interested in computers. Because schools have provided them with limited tasks
on computers under strict instructions as well as learners don’t have much knowledge
of computer. So in their opinion learners don’t feel comfortable in using computers by
their own because learners are not confident but learners could do if learner would be
properly guided by teacher. In a classroom of 35 learners there were only 10 to 12
computers in total. In Computer Assisted Learning there should be one computer per
individual otherwise we cannot extract the full potential of the technology.
In another case, there was no facility of Computer Assisted Learning in the school in which the teacher had gone to teach. So he/she never found learners using any Computer Assisted Learning material themselves.

**Comprehensibility**  (5 teachers with Teacher ID 1.05, 1.13, 1.12, 1.03, 1.08)

On using Computer Assisted Learning materials on their own a learner just needs an initiation to encourage learning on one's own. But Computer Assisted Learning materials are made in a manner that makes it simple to learn. There is no need to have a formal set of education system, but yet learner needs an initiator.

**Curiosity and interest**  (10 teachers with Teacher ID 1.05, 1.11, 1.25, 1.12, 1.22, 1.14, 1.28 1.21, 1.03 1.08)

During their school experience, the teacher experienced that learners are very curious to know about the various concepts of science through experiments and presentations. The school had provided us with the facility of a computer in each classroom, thus enabling us to get used to such a method of teaching/learning. The learners were always ready to learn through computer-based activities, demonstrations and presentations. Learners (the learners) preferred to learn through computers, rather than the normal classroom situation. The Learners are very interested to read/study by different methods. Teacher found that learner became bored by teacher centred methods.

**Metacognition**  (6 teachers with Teacher ID 1.05, 1.25, 1.30, 1.14, 1.03, 1.08)

Learners feel comfortable in using Computer Assisted Learning material on their own. It gives them independent environment. Computer Assisted Learning material gives them a scope to explore things & understand phenomenon with a lot of curiosity. This type of learning is also retained for long time which is helpful in their further learning.

**Previous experiences**  (5 teachers with Teacher ID 2.07 1.28, 1.26, 1.02, 2.08)

Learners who know about computer and its working style, were very excited, encouraged and took interest in the Computer Assisted Learning material and the learners who did not know about computers felt that it was difficult, tough and were not interested in learning through Computer Assisted Learning material,

As for their school experience, teachers thought that their learners were not able in using Computer Assisted Learning on their own. This is because their learners did not
have any knowledge or skills for using computers. There was no computer in the store. It is necessary that learner must know about computer and how to use it. Therefore before using computer for Computer Assisted Learning learners should know some skills of using computer and there should be provision of appropriate number of computers in school. 

No use of computer – 3 Teachers
(Teacher ID 1.16 1.12 1.18)
These Teachers didn’t use computer at all.

6.2.4 Availability of Computer Assisted Learning material (frequencies are already given)

As per the time teachers have come across the Computer Assisted Learning materials.
Four categories are following

Never experienced
Out of 30 teachers, 15 (50%) (with Teacher IDs- 1.03, 1.05, 1.06, 1.07, 1.13, 1.18, 1.20, 1.21, 1.22, 1.24, 1.28, 1.29, 2.05, 2.07, 2.08) had never come across any Computer Assisted Learning material in their life and 3 did not respond.

Experienced as school learner
There was no teacher who had come across Computer Assisted Learning material as a school learner. Though some teachers have heard about or seen the outer cover of interactive CDROM’s and DVDROM’s in book fairs or anywhere else. But none of them actually came across and experienced them properly. Almost everyone was taught in a typical lecture method and everyone was from a school which could not afford such techniques to teach.

Experienced in graduation (2 Teachers with ID 1.16 and 1.14)
In graduation a teacher (with Teacher ID- 1.16) used Computer Assisted Learning material on the topic Aviation. In that Computer Assisted Learning material the topics were presented in such a way that anyone could understand the topic in a simpler way as in that she used the pictures with the corresponding regions of consideration.
Another teacher (with Teacher ID-1.14) used Computer Assisted Learning material on the topic of human genome. In this material the topic was presented in such an augmented or proper manner that learner could grasp the idea very easily. The human genome system was in an animation format using latest 3-D technique. This gave them a new experience to learn.

**Experienced in B.Ed.** (10 teachers with Teacher ID- 1.02, 1.04, 1.08, 1.10, 1.11, 1.12, 1.19, 1.25, 1.26, 1.30)

During their B.Ed. computer practical classes, 5 teachers (with Teacher IDs- 1.02, 1.04, 1.12, 1.19, 1.25) come across the use of ‘hot potatoes’ software in which there were so many programmes that could be designed on various science topics. They were guided to design many types of quizzes, jumble words, gap fill exercises and match making exercises.

Here the instructions were provided to questions and activities to make them simple to comprehend. If learners find difficulty they can use the hints, if they give the wrong answers they will not proceed to the next step in some activities, they will gain the points for right answers, which will act as the motivator.

Some programs help learners learn key vocabulary words; others demonstrate concepts such as how machines work, the life cycle of a butterfly, and the positions of the stars and planets. Learners can use websites to research information, find resources, or locate topics for science fair projects. Many science textbooks come with interactive CD-ROMs that can be used to reinforce ideas. Computer-created graphic organizers and concept maps can be used by learners to organize ideas in science or as a guide for interpreting information found in a science textbook. Learners can spend time in a virtual laboratory studying chemical reactions or observing a microscopic cell. They can answer questions about animals, see how clouds and mountains are formed, or watch the movement of the plates of our planet. There are games, quizzes, and information to support and enhance instruction. Problem-solving activities help learners improve their higher order thinking skills and challenge all learners.

In short no teacher had experienced any Computer Assisted Learning material except hot potatoes or certain power point presentations.
6.2.5 Understanding Teachers’ Perception of Alternative Frameworks

Q5. What do you know about Alternative Frameworks/misconceptions in science and their formation?

Teachers’ views about Alternative Frameworks have been understood to be including the following features.

According to the teachers, Alternative Frameworks among learners in science may be

- Known fixed knowledge about science that can be modified or changed when something new with evidences come up.

  Science has a nature that is changeable. It is not fixed and permanent. Previous knowledge about science can be modified or changed if something new with evidences and proofs come up (Teacher ID-1.06).

- Views held by the learners which don't really coincide with scientific views.

  When a learner forms his/her own concepts which are different from actual concepts, these are called Alternative Frameworks/misconceptions. These are the views held by the learners which don’t fully coincide with scientific views. The most common reason for formation of Alternative Frameworks is everyday talk (Teacher ID-2.07).

  - e.g. – The sun rises in the east. It is a very common sentence of everyday talk but it is also a misconception because the sun doesn’t rise in the east. It is the earth which is moving round the sun. Other reasons for Alternative Frameworks/misconceptions are - people use simple language to explain concepts, everyday experiences, socio-cultural contexts, subjectivity of the learner, teacher’s inappropriate guidance i.e. the teacher focuses on product rather than the process etc. Once an alternative framework is formed it shows resistance to change.

- A concept in which learners may be unable to understand the whole process clearly and constructs their own ideas about the possibility of process. It can be formed if the content is not presented or taught in the class in proper sequences. Some complex topics are being defined in some small step series in which when some steps are missed then a learner by oneself constructs ideas on the basis of the available steps which create the trouble of diversion of mind from correct explanation to illusive or downright explanation. For
example at earlier time it the prevalent misconceptions among people were that earth is flat in shape while it was not (Teacher ID-1.02).

- Preconceived notion or conceptual misunderstanding when something that a person knows and believes does not match with what is known to be scientifically correct. Alternative framework / Misconceptions are views held by pupils that do not fully coincide with scientific views. They can be held by a large proportion of the population or just by an individual based on personal experience. Often they are developed through everyday talk (Teacher ID-1.19).

- Alternative Frameworks may be:
  - constructed from everyday experience and usually adequate for everyday life
  - personal or shared with others
  - used to explain how the world works in simple terms
  - similar to earlier scientific models (e.g. the earth is flat)
  - inconsistent with science taught in schools
  - resistant to change.
  (Teacher ID-1.05)

- An unfounded belief that does not embody the agreement of fear, good luck, faith, or supernatural intervention, frequently the intuitive understanding of the world around them that does not agree with the scientific explanation. Many ideas pupils hold about the world around them come from sensory experience. They construct a framework from these events that is coherent and fits their experiences, but which may be very different from the scientific view (Teacher ID-1.13).

- Views children hold that differs from conventional scientific explanation or classification (Teacher ID-1.25).

- Some complex topics that are defined in some small series and some step is missed preconceived notions, conceptual misunderstandings and non-scientific beliefs that a person holds, he/she is never aware of the fact that his or her ideas and beliefs are incorrect (Teacher ID-1.12).

- Myths which are constructed by people not using logical and critical thinking
Children's belief about things that they expect and something which enables them to predict future events (Teacher ID-1.03).

Inferences about any phenomena of nature, that are not actually true (Teacher ID-1.07).

Science teachers reported the following reasons for the formation of Alternative Frameworks:

- everyday talk or everyday use of language (Teacher ID-1.05).
- people using simple language to explain concepts (Teacher ID-2.07).
- everyday experiences (Teacher ID-2.07) (Teacher ID-1.05).
- socio-cultural context (Teacher ID-2.07).
- subjectivity of the learner’s interpretations (Teacher ID-2.07).
- inappropriate guidance by the teacher (Teacher ID-2.07).
- content not presented or taught in the class in proper sequence (Teacher ID-1.02).
- children’s own experiences combining with logic and non-scientific understanding (Teacher ID-1.19).
- wrong interpretation of different concepts (Teacher ID-1.25).
- previous misbelieve or misconception about any topic (Teacher ID-1.25).
- Alternative Frameworks are generally caused due to the myths which are considered by people not using any logical and critical thinking. For example an asteroid falling down on and then it is seen by the people, they say that any wish asked for at that point of time will be fulfilled and people don't use their minds, and so misconception arises (Teacher ID-1.29).
- just having theoretical knowledge of topic (no practical orientation) (Teacher ID-1.10).
- handed down from one person to the another (Teacher ID-1.04).
- theory put by scientists are wrongly interpreted, the scientist tends to forget that common people do not understand scientific language (Teacher ID-1.04).
- the effect of religious beliefs (Teacher ID-1.07).
The following is the nature of Alternative Frameworks as has been described by many teachers:

- linked to everyday use of language (Teacher ID- 1.03,1.05,1.30,2.07)
- may be personal or shared with others (Teacher ID-1.05, 1.30)
- similar to our earlier scientific models like Earth being flat(Teacher ID-1.05,1.30)
- inconsistent with science being taught (Teacher ID-1.05, 1.30)
- resistant to change (Teacher ID-1.05, 1.30)

Teachers think the Alternative Frameworks can be addressed by:

1. Identifying the Alternative Frameworks by listening to them properly and questioning learners vis-à-vis these (Teacher ID-1.19).
2. Teachers identifying learners, existing ideas by diagnostic assessment(Teacher ID-1.13)
3. Teacher should be well read and well aware(Teacher ID-1.04)

Some examples given by the teachers related to the Alternative Frameworks are as under:

1. A nucleus in a blood cell is used to store food(Teacher ID-1.05)
2. In eye images are formed on the cornea(Teacher ID-1.05)
3. In chemistry-organic means natural(Teacher ID-1.05)
4. Heat rather than hot air is thought to rise(Teacher ID-1.05)
5. Magnetism is involved in chemical bonds(Teacher ID-1.05)
6. When things dissolve, they disappear(Teacher ID-1.03)
7. Formation of rainbow is due to Indra Devta.(Teacher ID-1.07)

6.2.6 Characteristics of desirable Computer Assisted Learning program

Q6. In your opinion what may be the characteristics of a good Computer Assisted Learning material in science?

As per the science teachers, the characteristics desirable Computer Assisted
Learning programs are:

One of the teachers has pointed out very clearly that Content supplemented with instructions, self test, interactive questions, ample no of activities to make the concept of science more clear, demos of natural activities such as formation of rainbow etc, graphics, dill and practice, etc.

**Table 23 - Analysis of the characteristics of Computer Assisted Learning perceived by science teachers**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Theme Identified</th>
<th>Teacher ID</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Liberty to the learner to arrange pace of learning as per their own needs.</td>
<td>1.18, 1.29, 1.16, 2.07, 1.10, 1.12, 1.03</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Carefully interwoven images, videos, audios, effects and text.</td>
<td>1.02, 1.19, 1.20, 1.25, 1.12, 1.04, 1.29</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Appealing animation effect.</td>
<td>1.02, 1.19, 1.25, 1.20, 1.12, 1.04</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Include self-assessment, interactive questions and ample number of activities.</td>
<td>1.06, 1.05, 1.30, 1.28</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Inclusion of drills and practices.</td>
<td>1.05, 1.13, 1.25, 1.04</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Motivating for the learner.</td>
<td>1.19, 1.10, 1.29, 1.03</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Develop interest in science.</td>
<td>1.25, 1.20, 1.04, 1.07</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Interactive.</td>
<td>1.05, 1.06, 1.03</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Gave immediate feedback to the learner.</td>
<td>1.19, 1.29, 1.03</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Easy to understand.</td>
<td>1.19, 1.30</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Include interesting games.</td>
<td>1.13, 1.28</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>Learner gets the liberty to repeat tutorials.</td>
<td>1.11, 1.29</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Adapts to the learners’ individual needs.</td>
<td>1.11, 1.10</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Simple and comprehensive language.</td>
<td>1.12, 1.30</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>Enables learners to gain hands on experiences and increase their skills.</td>
<td>1.18, 1.16</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>The content should be supplemented with instructions.</td>
<td>1.06</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Demonstration of natural activities such as formation of rainbow.</td>
<td>1.06</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Validated and checked by experts in the field.</td>
<td>2.07</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>Material designed as per the socio-cultural context of the learner.</td>
<td>2.07</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>Content areas arranged in increasing level of difficulty.</td>
<td>1.05</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>Practical work oriented instructions.</td>
<td>1.05</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>Is appropriate for the age and stage of the learner.</td>
<td>1.19</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>Based on discovery approach, develop problem-solving skills and strategies.</td>
<td>1.13</td>
<td>1</td>
</tr>
</tbody>
</table>
Adaptable for distance learning environments.  1.11  1

Acquire information about learner’s current knowledge of the subject, his or her learning goals and prepares a profile based on that.  1.11  1

Give support for constructing and testing hypothesis.  1.04  1

Learner can select the level of challenge with which they feel comfortable.  1.18  1

Learners able to get life like experiences.  1.18  1

Match the curriculum settings.  1.07  1

Generating curiosity in the learner.  1.08  1

Provide regular and timely interaction with the instructor.  1.11  1

Makes the web based expeditions possible.  1.11  1

Should have structure for eliciting evidence of learner’s cognition and performance.  1.25  1

Supplement traditional methods and modes of the classroom learning.  1.1  1

Provide support for learner-learner and learner-teacher interaction.  1.1  1

6.2.7 Use of Computer Assisted Learning in addressing Alternative Frameworks

Q7. Do you think Computer Assisted Learning may be helpful in addressing Alternative Frameworks in science? Justify your answer.

{3 Teachers with ID 1.20, 1.26, 1.28 didn’t respond, Teacher ID1.22 said yes but didn’t explain how. Teacher ID 1.18, 1.16 thinks Computer Assisted Learning isn’t helpful}

Information resource (6 teachers with Teacher ID 1.13, 1.30, 1.07, 1.24, 1.21, 1.29)

One teacher thinks Computer Assisted Learning may be very helpful in addressing misconceptions in science. The internet is a large and global network of computer. It provides access to an essentially unlimited source of information.

Concretization (4 teachers with Teacher ID 1.05, 1.12, 1.24, 1.03)

It provides authentic and reliable knowledge and it is made by experts so there are rare chances of mistakes. It also provides opportunity to repeat or the learner can learn a thing many times the concept gets clear and can work on his own pace.
Computer Assisted Learning helps a learner in understanding on his/her own pace which leads to a better conceptual clarity.

**Drawing linkages** (5 teachers with Teacher ID 1.02, 1.11, 1.12, 2.05, 1.30)

Through the use of it we can make clear the missed steps because in Computer Assisted Learning all the content is arranged in a proper chronological pattern. By the use of Computer Assisted Learning material we can sequenced all steps of science complex topic in a chronological order of simple to complex and concrete to abstract so that no step is missed by the learner and can understand the whole process in a very interesting and interactive manner with defined logic and conclusion at the end of the whole process.

**Curiosity and interest** (6 teachers with Teacher ID 1.19, 1.25, 1.12, 1.04, 1.30, 1.03)

Computer Assisted Learning makes these learners able to develop curiosity. For example while he will asked to learn through Computer Assisted Learning material he will initially follow the instruction that lead him to learn by himself and find the answers by himself. When he is not successful in finding solutions to the problems he will ask for these from his teacher. Computer Assisted Learning brings out the curiosity about anything similar. He will be motivated to ask about his other misconceptions.

**Supporting imagination** (5 teachers with Teacher ID 1.06, 2.07, 1.11, 1.10, 1.03)

There are many concepts which are present in the real world but we can’t see them such as atoms, earth movement etc. Learners only imagine these concepts which are a major cause of Alternative Frameworks/misconceptions. As I took the earlier example the sun rises in the east is a common misconception. If we show the model of the solar system to the learners with the help of computer simulator it can be very helpful in remedying the misconception. Learner can see what is actually happening in the space and how does the sun seem us to rise in the east? Also a computer simulator about atom can prevent formation of alternative framework/misconception about atom if the concept is explained through it. If we take the previous example then learners can be shown an atom through graphics(which cannot b seen through naked eye) then it can b shown that it is made up of e, p, n with e revolving round the nucleus(p + n) them some emissions can b shown to show existence of more particles
and so on. This way the misconceptions about science can be broken through the use of Computer Assisted Learning.

**Thinking skills** (5 teachers with Teacher ID 1.13, 1.11, 1.25, 1.04, 1.14)

Science is a subject of phenomena, processes, experiments and experiences which give rise to be better at using Computer Assisted Learning. Computer Assisted Learning is helpful in giving opportunities of developing independent thinking in learners. It develops their existing ideas, e.g. from ‘food is useful for the body’ to realizing it is a substrate for respiration. It brings existing ideas together, e.g. make links between different body systems. It can change existing ideas, e.g. that energy is created or destroyed in life processes. Identify the areas of science pupils have problems with. Pupils discuss and challenge the ideas and consider evidence that might help them decide.

Pupils consider how misconceptions might have arisen. This process will succeed when pupils feel safe enough to admit that they do not know or are unsure, accept the uncertainty of science and develop discussion skill. Hence Computer Assisted Learning material is very useful in addressing alternate framework / misconceptions and science.

One teacher thinks that it is helpful because by using Computer Assisted Learning approach we are able to generate the scientific attitude and with original thinking which leads to the development of human welfare.

Pupils need to explore how and why misconceptions can arise. It is important to help them recognize that there are legitimate reasons for them. They also need to know that it is acceptable to change ideas as more information comes to light. Indeed, what they experience often mirrors how scientists in the past came to a view or amended their ideas.

### 6.2.8 Classroom experiences and Computer Assisted Learning in Science Learning

**Q8. Reflect on your classroom experience related to transaction of different concepts in the classroom and explain the impact it could have if you had the Computer Assisted Learning material related to that concept?**
**This question has been answered as first hand experiences of all teachers…**

Teacher ID-1.06 -If I had the Computer Assisted Learning material then it would have more impact on my learners than normal teaching aids like charts, etc which I used to explain many concepts. If topics like photosynthesis, water cycle etc had been taught using Computer Assisted Learning it would have had a lasting impression on children and they would have understood the concept with greater understanding.

Teacher ID-2.07 -I taught 2 chapters in my school. First chapter was ‘Work and Energy’ and the second chapter was ‘Sound’. In the first chapter I had so many things for concrete examples but in the second chapter I had very limited resources. Also some concepts could not be shown in the classroom such as Ultrasound, SONAR etc. In my school there was no provision of computers. Once I thought to take my laptop to the school but I cancelled my programme because of unmanageable situations of my class. It would have been much better if I had explained the concept of ultrasound with the help of computer simulator so the learners could actually see what I was saying. Similar could have been the case with SONAR. Also I could create interest among the learners using computer-assisted learning techniques.

Teacher ID-1.05 -Yes, due to use of Computer Assisted Learning the content delivery can be more effective. Use of Computer Assisted Learning help in supplementing laboratory and practical work. By watching such programmes or practical tasks learners can learn by watching before performing them in reality. Various topics like electric charges can be delivered by showing the activities which are not possible to execute in classroom.

Teacher ID-1.19 -In my practice teaching I have taught normally. Had I used Computer Assisted Learning material like slides presentations, multimedia, hot potatoes it could have been a good motivator for the learners. It could have enabled them to learn independently by using other recourses, develop curiosity while learning through new technique about the computer as well as the content. It would be helpful to develop the logical thinking. It would have helped me in identifying the misconceptions among them.
Teacher ID-1.13 -In my school there was a great strength of girls and as it was a government school. There was no facility of a computer lab. Had I used Computer Assisted Learning system it might contains a different experience because:-

- There is greater need for the teacher to act as a facilitator, as it might be the totally new concept to some of those.
- The level of instruction would have been better to make the learning accurate and effective for the learner.
- When teaching the chapter of light to the 6th standard learners, it would have been more effective. Also diversity of living being can be easily taught with more effects and impacts by using Computer Assisted Learning.

Teacher ID-1.11 -During my teaching of the learners of class VII, I experienced that they were curious to know about the scientific knowledge and the logical reasoning behind it. During the transaction of the concepts if I had preferred the Computer Assisted Learning material then they would have developed more logical knowledge about that concept and it would have left an ever-lasting impact in their minds as it would have been easier to understand.

Teacher ID-1.25 -If we have Computer Assisted Learning material for the transaction of diff. concepts, it could be more beneficial. They are free to choose any activity using Computer Assisted Learning material & explore the things with more divergent thinking. Learners feel excited to learn through Computer Assisted Learning material as it provides encouraging & curious environment to the learners.

Teacher ID 1.20- When I taught chapter Motion in class VI, it was very tough for me to explain and give examples so that learners could understand the concept of motion and types of motion. If I had Computer Assisted Learning, I could show videos related to that topic which would help learners to understand in a better way and it would have been easy for me as there are many examples in our daily life related to motion but it is good to see that in classroom so they can learn in more better way.

Teacher ID-1.10 - The picture of school experience would have been different as it could have made the teaching learning process quite interesting and effective.
It also could have given me the chance to make better understanding of different concepts on their part had the Computer Assisted Learning material related to different concepts of science been used. Also it could have raised the confidence level of mine as a teacher as well as that of learners.

Teacher ID-1.12 -When I was teaching magnets in class then sometime I faced many difficulties when using the teaching aids while conducting an activity or demonstration in the classroom. In some situation indiscipline among learners due to lack of interest in that as it was to be taught in a traditional repeated boring method. As a result, it became so difficult for me to teach the topic in more interesting and practical way. Had I used Computer Assisted Learning material then I could have taught them the whole process in practical form and in interesting way which maintained their focus on the topic for a long period of time. By the animation effect used in presentation it could have become so easy for me to show the magnet field area around magnet and the magnet effect of north and south pole etc.

Teacher ID-1.30 -If some power point presentation could have been demonstrated in classroom than it would have been more effective and knowledgeable for me. In science topics there should be some power point presentations, computer software and other IT enable educations methods so that we could understand the concepts easily.

Teacher ID-1.04 -My school experience related to transacting different concepts in the classroom was very good. As I understood that the learners learn better if taught through teaching aid or by doing any activity. Teaching through teaching aids or through activities motivate learners & make them learn by their own interest. But still I felt that the impact of Computer Assisted Learning material would make the teaching learning process more effective & beneficial for the learners as, it provide the situation in which learners can learn things at their own pace & time frame. They are free to choose any activity using Computer Assisted Learning material & explore the things with more divergent thinking. Learners feel excited to learn through Computer Assisted Learning material as it provide encouraging & curious environment to the learners. So, this initiates the process of self learning.

Teacher ID-1.18 -I didn't use the computer during my teaching practice or
school experience but I could have had a great impact if I had the Computer Assisted Learning material related to that concept like I taught transportation in plants and animals and it could be taught more interestingly by using a video on transportation of and animals that learners understand better and in an interesting way. There are some characteristics of a good Computer Assisted Learning material in science written below:

- A good Computer Assisted Learning is always made from the child’s point of view that is child centred. There are always properly & sequentially arranged concepts pertaining to science concepts that move from easy to difficult. Learning goes on using comprehension & exploration of concepts related to science. It is highly individualized that is one computer for each learner.

Abdul: learning enhances using Computer Assisted Learning

Teacher ID-1.14-In my teaching practice, I had used a lot of methodology in my classroom to make my class effective and adaptive. I think when I used Computer Assisted Learning material could make them understand clearly and simply.

Teacher ID-1.28-If I had the Computer Assisted Learning material then, it would have made learning interesting and exciting. Since, the new concepts and ideas in the class can be encouraged to understand and transact there on. So Computer Assisted Learning material could have proved beneficial, if I had used it.

Teacher ID-1.21-In my school experience whenever I had any doubts related to the concept and I always took the help of computers. With the help of internet I always tried to get wide and deep knowledge of any concept.

Teacher ID-1.16-I didn't use a computer during my teaching practice on school experiences, but yes, it could have a great impact. Had I used Computer Assisted Learning material related to the subject and concepts I taught, it could have been taught more interestingly by using a video on transportation in plants and animals so that learners understood it better and in interesting ways.

Teacher ID-1.03- I transacted the various topics in my science class for example transportation in animals and plants, erosion of soil etc. I think with all these Computer Assisted Learning material, it may have got clearer. Through Computer Assisted Learning, I could have shown transportation of food and water in plans to xylem and phloem. Movement of blood in arteries, exchange of gases etc can be
clarified through the help of Computer Assisted Learning. Computer Assisted Learning material cannot replace the teacher in the classroom but can enhance the effectiveness of teaching and learning.

Teacher ID-1.24-After my classroom teaching I feel that in the elementary classes, some chemistry topics would have been more clear to them if they had been taught through Computer Assisted Learning for example chemical reactions.

Teacher ID-1.07-Know, I had no Computer Assisted Learning material to transact any concept related to science in my classroom. If there was any facility provided, then I would have definitely used Computer Assisted Learning material in the teaching science.

Teacher ID-1.08- I did not use any particular Computer Assisted Learning program to transact any concept in my classroom teaching. But I feel that in secondary classes, someday these topics will be taught more creatively using Computer Assisted Learning. For example reactions, chemical changes in chemicals and reactions. The reason being learners are not able to use chemistry lab at the secondary level. But with the use of Computer Assisted Learning these can be more effectively and easily retained by learners. The secondary classes play an important in choosing the stream after class tenth. So, we need to take up these topics more efficiently and effectively so that they can choose science in higher education

Teacher ID-2.08- During my teaching practice I have taught Archimedes Principle and Buoyancy, complete chapter of Work and Energy and Sound to class 9th. To Understand Archimedes Principle and Buoyancy Computer Assisted Learning would have been a great help and even to explain the concepts of sound it would have been easier if Computer Assisted Learning had been used in the class. As in sound learners have doubts in understanding a concept clearly as it is very difficult to explain all concepts of sound using experiments. By virtual experimentation many of them would have been able to understand those concepts clearly.

6.3 Conclusions

The summary of teachers' interpretation of their classroom dynamics, learners' preferential style of resolving an issue in their mind have been expressed in the chapter. Classroom dynamics, nature of questions that come to their mind and how
they resolve those questions; have a lot of variations and diversity. There might be a relation between their socio economic context and the way they resolve their queries, resources available to them etc but was not explicitly intended in the study. The main conclusion regarding the patterns of preferential styles of learning remains that we cannot take a position of one size fits all. The Computer Assisted Learning framework that is needed to resolve these issues is difficult to imagine in this regard and it is not within individual human capacity to design some Computer Assisted Learning framework that can cater to these diverse needs. Also, in preliminary inquiry, it seems that no CAI/ Computer Assisted Learning or other forms of ICT inputs are ready to incorporate such diverse needs of learners and their frameworks.

Resume: This chapter analysed various issues related to teachers’ perception of computer-assisted learning in the context of using it for addressing alternative frameworks among learners in science. The analysis has brought forward the science teachers views opinions and understanding on these issues. There had been repetitions of ideas in the science teachers perceptions that reaffirm the notions revealed. An overall understanding has developed that a lot of diversity and differentiation is there in the views opinions and perception of science teachers. Analysis done in this chapter along with the analysis done in the previous one has been used to develop relevant findings and conclusions in terms of the objectives of the research undertaken.